GOVERNMENT OF INDIA
ATOMIC ENERGY
LOK SABHA

UNSTARRED QUESTION NO:3318
ANSWERED ON:22.03.2017
Thorium based Nuclear Energy
Joshi Shri Pralhad Venkatesh

Will the Minister of ATOMIC ENERGY be pleased to state:

(a)whether the Government has conducted/proposes to conduct any study on the feasibility of Thorium as a fuel for the generation of atomic energy in the country and if so, the details and the outcome thereof and if not, the reasons therefor;

(b)whether the country has the world's largest proven reserves of Thorium and if so, the details thereof, State/UT-wise;

(c)whether the said Thorium reserves in the country has the potential to satisfactorily meet the overall energy requirement of the country and if so, the details thereof along with the steps taken/being taken with regard to the utilisation of the said reserves; and

(d)the current status with regard to the research and development of the Advance Heavy Water Reactor (AHWR) along with the cause of delay, if any, reported in the development of the said reactor?

Answer

THE MINISTER OF STATE FOR PERSONNEL, PUBLIC GRIEVANCES & PENSIONS AND PRIME MINISTER'S OFFICE (Dr. JITENDRA SINGH) :

(a)Other than natural Uranium, Thorium is the only other naturally occurring nuclear material that can be used to generate nuclear power. However, Thorium has to be converted to Uranium-233 in a reactor before it can be used as fuel. The 3rd stage of Indian Nuclear Power Programme of DAE is entirely based on effective use of Thorium in a self sustaining closed fuel cycle option. Hence, DAE has planned the use of large deposits of thorium available in the country as a long-term option. Various feasibility studies and vision documents have been prepared to shape the third stage of our nuclear power programme wherein thorium will be utilized on a large scale. These studies provide a roadmap for technology development and for deployment of thorium based systems. The main elements in this road map include demonstrating the use of thorium on an industrial scale in Advanced Heavy Water Reactor. This experience will provide the way forward for development of technologies required for various advanced reactors like the Molten Salt Reactors, High Temperature Reactors and Accelerator Driven Reactor Systems.

(b)The total resource of monazite contained in 128 deposits is 12.47 million tonne (Mt) [as on February, 2017] as has been established by the Atomic Minerals Directorate for Exploration and Research (AMD). Monazite in the placer deposits of India contains on an average 9-10% ThO2. The monazite resource (12.47Mt) contains about 1.12 million tonne ThO2. State-wise details of in situ monazite resource established by AMD are given below:

State No. of deposits Resource (Mt)
Odisha 10 3.06
Andhra Pradesh 26 3.69
Tamil Nadu 51 2.46
Kerala 35 1.84
Maharashtra 3 0.004
Gujarat 1 0.003
West Bengal 1 1.20
Jharkhand 1 0.21
Total 128 12.47

(c)Fast breeder reactors (FBR) are planned to be built in the second stage of our nuclear power programme. These reactors will be loaded with Thorium fuel for breeding U233 after sufficient capacity (MWe) of FBR is built. Thorium with inbred U233 will be loaded in breeder reactor of third stage for self sustaining fuel cycle and energy production.

Potential of Plutonium based FBR is 500 GWe (beyond year 2055) and that of Thorium reactor is > 600 GWe (beyond year 2065)

Design of 300 MWe Advanced Heavy Water Reactor (AHWR) using thorium based fuel has been completed. This reactor will serve as a technology demonstrator for not only the thorium fuel cycle technologies, but also several advanced passive safety features.

A Critical Facility has been constructed in BARC, and is being used for carrying out experiments to further validate the physics design features of AHWR.

(d)The 300 MWe AHWR designed by BARC is intended to serve as a technology demonstrator for Thorium utilisation as well as for validating several advanced safety features that have been incorporated in the design of this reactor. The design of all nuclear

systems of the reactor has been completed. Several innovative features of the design are being validated through large scale engineering experiments. In order to facilitate an early scrutiny of the innovative features of the design from the safety considerations, a Pre-Licensing Design Safety appraisal of the reactor has been completed by the Atomic Energy Regulatory Board. Construction of this reactor can begin after associated statutory and regulatory clearances are obtained and financial sanction for the project is obtained.

****